



November 2, 2020

Filed via IBFS

Ms. Marlene Dortch, Secretary
Federal Communications Commission
45 L Street NE
Washington, DC 20554

Re: AST & Science, LLC
SAT-PDR-20200413-00034
SAT-APL-20200727-00088

Dear Ms. Dortch:

TechFreedom¹ writes to express our concern over the above-referenced Petition for Declaratory Ruling seeking U.S. market access for a new constellation of 243 NGSO spacecraft in sixteen orbital planes at the altitude of 700 km. The Commission placed the Petition on Public Notice October 2, 2020.² TechFreedom urges the FCC to take a hard look

¹ TechFreedom is a non-profit think tank dedicated to promoting the progress of technology that improves the human condition. To this end, we seek to advance public policy that makes experimentation, entrepreneurship, and investment possible, and thus unleashes the ultimate resource: human ingenuity. Wherever possible, we seek to empower users to make their own choices online and elsewhere. TechFreedom lawyers have been involved in issues of space law, and orbital debris, for nearly four decades. See James E. Dunstan, co-author, *The Geostationary Orbit: Legal, Technical and Political Issues Surrounding Its Use in World Telecommunications*, 16 CASE W. RES. J. INT'L L. 223-63 (1984); James E. Dunstan & Bob Werb, *Legal and Economics Implications of Orbital Debris Removal: Comments of the Space Frontier Foundation*, DARPA ORBITAL DEBRIS REMOVAL (ODR) REQUEST FOR INFO. FOR TACTICAL TECH. OFF. (TTO), DEF. ADVANCED RES. PROJECTS AGENCY (DARPA), SOLICITATION NUMBER: DARPA-SN-09-68, Oct. 30, 2009; James E. Dunstan, 'Space Trash: Lessons Learned (and Ignored) from Space Law and Government', 39 J. OF SPACE L. 23 (2013); James E. Dunstan, *Do we care about orbital debris at all?*, SPACENEWS (Jan. 1, 2018), available at <https://spacenews.com/op-ed-do-we-care-about-orbital-debris-at-all/>.

² See *Satellite Policy Branch Information*, Report No. SAT-01501, (Oct. 2, 2020).

at the applications, and defer action on the Petition until it adopts new rules in IB Docket No. 18-313, “Mitigation of Orbital Debris in the New Space Age.”³

TechFreedom shares the concerns expressed by NASA in its October 29, 2020, letter, filed in this docket (“NASA Comments”). NASA’s comment that “[t]he AST constellation contains extremely large satellites in a debris-rich orbital regime and will therefore experience a very large number of satellite conjunctions,” is an understatement worthy of the folks who brought us “The Right Stuff.”

There are five factors that make the present Petition unique in terms of the potential for centuries of damage to the orbital ecosystem:

- **The size of the individual AST satellites.** With an antenna cross-section of 900 meters squared,⁴ each of these satellites is huge in comparison to the proposed constellations of other NGSO operators.⁵
- **The number of satellites.** The proposed constellation will consist of 243 satellites. While this number may seem small compared to other proposed NGSO systems, this constellation would increase the total number of currently operating satellites by nearly 10 percent.⁶
- **The orbit into which AST intends to place the satellites.** AST is proposing to place its satellites into the crowded 700 km orbit, which, because of its altitude, does

³ *Mitigation of Orbital Debris in the New Space Age*, Report and Order and Further Notice of Proposed Rulemaking, FCC 20-54, released April 24, 2020 (“*Orbital Debris Order*,” and “*Orbital Debris Proceeding*”).

⁴ See NASA Comments, 2.

⁵ The Starlink satellites each have a cross-section of approximately 32 meters squared, see *What are the dimensions for each satellite?*, REDDIT, https://www.reddit.com/r/Starlink/comments/g9aot6/what_are_the_dimensions_for_each_satellite/ (last visited Nov. 2, 2020); the OneWeb satellites are considerably smaller, with a cross-section of around 3 meter squared, see *OneWeb Minisatellite Constellation for Global Internet Service*, EOPortal DIRECTORY, <https://directory.eoportal.org/web/eoportal/satellite-missions/o/oneweb> (last visited Nov. 2, 2020) (approximate cross-section given the known size of the satellite body and proposed solar panels).

⁶ See *Number of satellites in orbit by major country as of March 31, 2020*, STATISTA <https://www.statista.com/statistics/264472/number-of-satellites-in-orbit-by-operating-country/#:~:text=Of%20the%20%2C666%20active%20artificial,China%2C%20accounting%20of%20only%20363.&text=Artificial%20satellites%20are%20human%2Dmade%20objects%20deliberately%20placed%20in%20orbit> (2,666 active satellites as of March, 2020) (last visited Nov. 2, 2020).

not easily “self-clean.”⁷ Not only is this orbit currently occupied by the NASA A-Train satellite system, but the orbit also contains, or is being bombarded by, the remnants of the two largest debris-producing collisions in history, the 2007 Chinese Fengyun-1C anti-satellite test (producing over 3,000 pieces of debris),⁸ and the 2009 Iridium 33/COSMOS 2251 collision (producing almost 2,000 pieces of debris).⁹

- **The completely new design of these satellites, built by a “start-up” entity.** AST’s petition admits that it is a “start-up” with no experience or expertise in building satellites, let alone the gigantic satellites proposed in its Petition. In analyzing the potential for collision, the FCC requested that AST conduct an analysis assuming a ten percent (10%) failure rate,¹⁰ and NASA’s comments assume a failure rate of four percent (4%). Yet history tells us that, for completely new satellite systems without significant heritage in terms of either satellite design or satellite builder, the failure rate may be well above 10%, and may approach the thirty percent (30%) failure rate experienced by the Iridium system.¹¹ At even half (15%) of the Iridium first generation failure rate, that still will create a combined cross section of 36,000 square meters of junk over the next decade around which other operators will have to maneuver, not to mention the existing debris which can’t move to avoid new debris caused by the AST constellation, including the dead Iridium satellites that are slowly making their way down into the 700 km orbit.
- **AST is licensed by an authority without significant expertise in orbital debris analysis.** The fact that AST, a U.S. entity, sought its licenses not from the FCC, but from Papua New Guinea, should give the FCC further pause. The FCC should undertake a dialog with its counterpart in Papua New Guinea to determine the extent to which that regulatory agency is capable of overseeing AST’s activities. The

⁷ See *Orbital Debris Order*, ¶ 43 (“missions deploying above 650 km altitude may represent a greater risk from a long-term orbital debris perspective, since satellites that fail above that altitude will generally not re-enter Earth’s atmosphere within 25 years, and depending on the deployment altitude, may be in orbit for centuries or longer”).

⁸ See Brian Weeden, *2007 Chinese Anti-Satellite Test Fact Sheet*, SECURE WORLD FOUND. (Nov. 23, 2010), available at https://swfound.org/media/9550/chinese_asat_fact_sheet_updated_2012.pdf.

⁹ See Brian Weeden, *2009 Iridium-Cosmos Collision Fact Sheet*, SECURE WORLD FOUND. (Nov. 10, 2010), available at https://swfound.org/media/6575/swf_iridium_cosmos_collision_fact_sheet_updated_2012.pdf.

¹⁰ See Letter from Jose P. Albuquerque, Chief, Satellite Division, International Bureau, to Sallye Clark & Laura Stefani, IBFS File No. SAT-PDR-20200413-00034; Call Sign: S3065 (filed June 3, 2020).

¹¹ See Jeff Foust, *Starlink Failures Highlight Space Sustainability Concerns*, SPACENEWS (July 1, 2019), available at <https://spacenews.com/starlink-failures-highlight-space-sustainability-concerns/#:~:text=%E2%80%9CWWe've%20created%2C%20inadvertently,original%20fleet%20of%2095%20satellites> (Iridium’s CEO Matt Desch describing its first generation failure rate of 30%).

Petition certainly smacks of a “flag of convenience” arrangement with little hope of effective oversight of potential future orbital debris problems.

Individually, each of these factors can be accounted for, and possibly mitigated against. Taken together, however, these unique factors raise exponentially the risk of future debris and potential collisions generated by this constellation. In this regard, we think that the NASA analysis significantly understates the actual potential threat. This truly could cause a worst case-scenario, and exactly the situation NASA scientist Donald J. Kessler proposed back in 1978 of a cascading series of collision events rendering an entire orbit unusable (the “Kessler Syndrome”).¹²

In the Orbital Debris Proceeding,¹³ the FCC has recognized the vital role it plays in administering Space Policy Directive-3 (“SPD-3”), titled “National Space Traffic Management Policy.”¹⁴ This includes not only in issuing licenses, but also in determining whether to grant petitions for market access.¹⁵ The issues being debated in that proceeding will have an impact on the space environment for generations. Because of this, TechFreedom urges the Commission to defer action on the instant petition until it completes the current proceeding and issues rules pursuant to the FNPRM, including potential indemnification and/or bond requirements.¹⁶ TechFreedom understands that this may interject some uncertainty for AST, but given that it has chosen both the technological and regulatory approaches it has, which raises significant issues related to potential future orbital debris that could last centuries, this slight delay is unavoidable.

Respectfully submitted,

_____/s/_____
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¹² Donald J. Kessler, *Collision frequency of artificial satellites: The creation of a debris belt*, 83 A6 J. OF GEOPHYSICAL RES. 2637-46 (1978).

¹³ *Orbital Debris Order* at ¶ 7.

¹⁴ Space Policy Directive-3, National Space Traffic Management Policy, Presidential Memorandum (June 18, 2018), <https://www.whitehouse.gov/presidential-actions/space-policy-directive-3-national-space-traffic-management-policy/>.

¹⁵ *Orbital Debris Order* at ¶ 79 (citing *Mitigation of Orbital Debris*, Second Report and Order, 19 FCC Rcd 11567, ¶ 94 (2004) (“2004 Orbital Debris Order”)).

¹⁶ See *id.* at ¶ 203.

Certificate of Service

Pursuant to 47 C.F.R. § 25.154, I hereby certify that a copy of the above letter was sent, via electronic mail, on November 2, 2020 to:

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_____/s/
James E. Dunstan